

SKP8CMINI

Tutorial 2

Creating A New Project Using HEW



Overview

This tutorial describes the steps in creating new projects for the R8C using two different methods.

The first method uses the SKP project generator that will create an empty project.

The second method will provide step by step instructions on how to create a new project with existing source files.

To get the most out of the SKP including the development tools, check out the references at the end of this tutorial.

Note: *This tutorial assumes the user has done the following:*

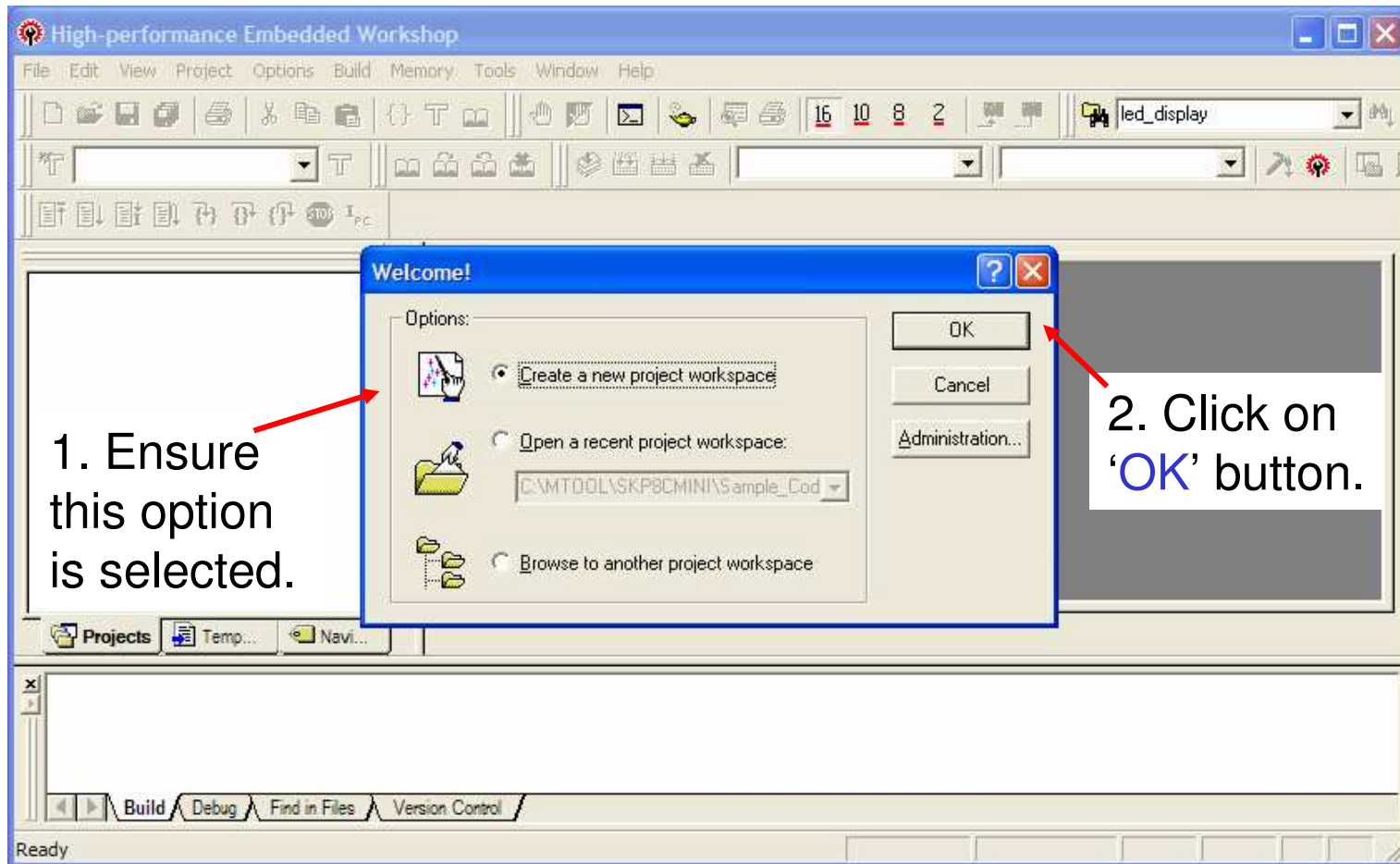
1. *Followed the 'Quick Start Guide'*
2. *Installed the SKP files, examples, and software tools in the default directories.*
3. *Reviewed Tutorial 1.*

Starting HEW



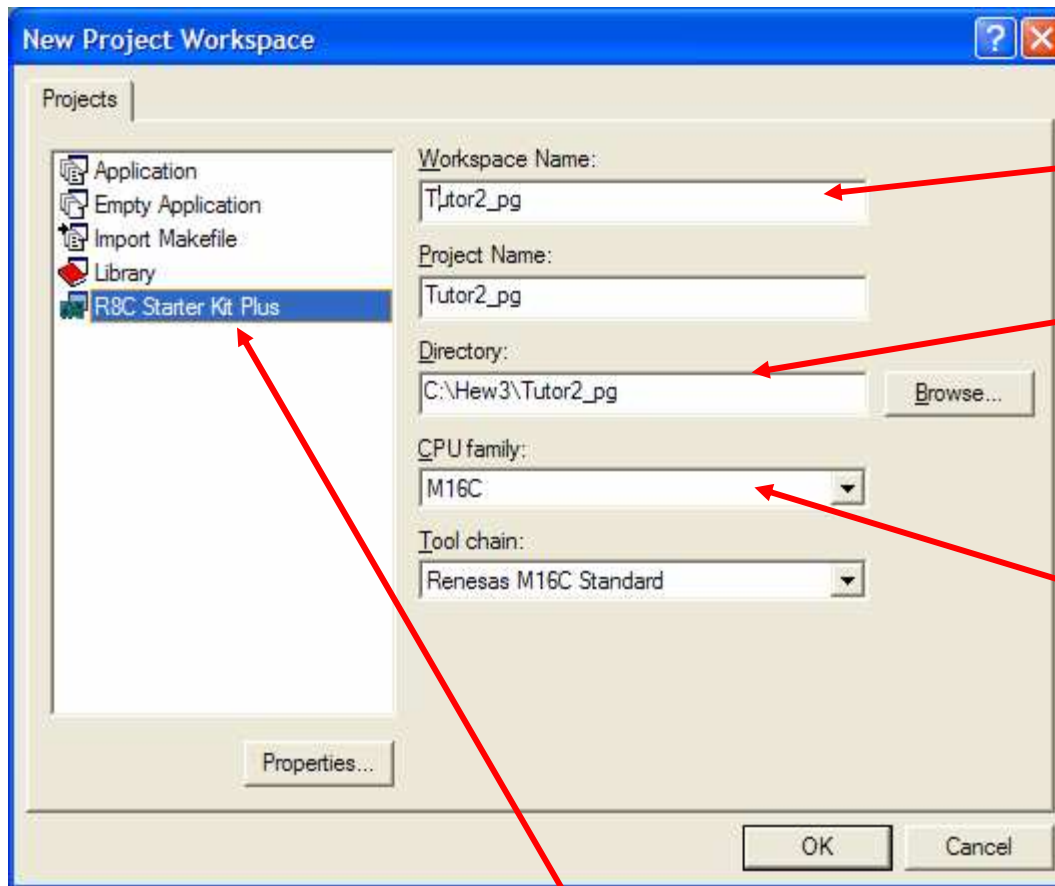
From the Windows Start menu, click on
**Programs > Renesas High-performance Embedded Workshop>
High-performance Embedded Workshop**

Creating a Project Workspace



When HEW starts up, you will be prompted to select a workspace. By default, 'Create a new project workspace' option is selected.

Creating a new project with the SKP project generator (1/4)



1. Enter 'Tutor2_pg'.

Note: This is the directory where the project will be created.

2. Select M16C.

3. Select 'R8C Starter Kit Plus' as the project type.

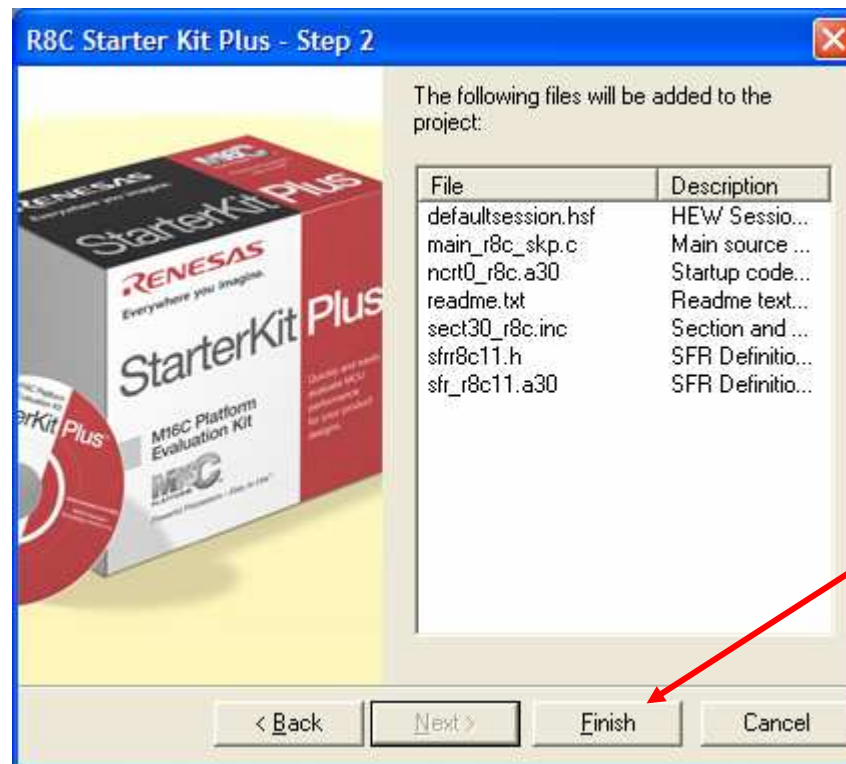
Creating a new project with the SKP project generator (2/4)



Select 'Empty Project'.

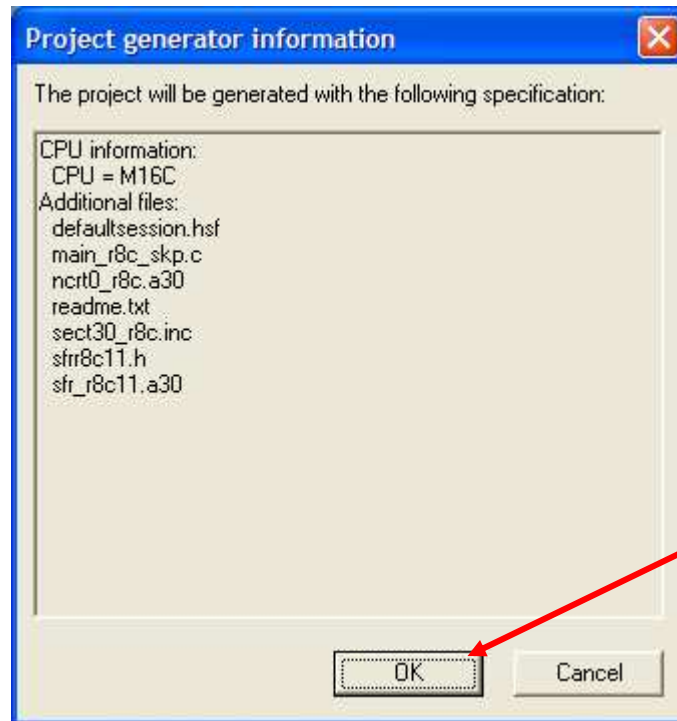
Note: The other project selections (Verify SKP & Sample Code) allow you to test the SKP and evaluate the MCU peripherals and features using pre-built sample code.

Creating a new project with the SKP project generator (3/4)



Step 2 shows the files that will be added to the new project and their descriptions.

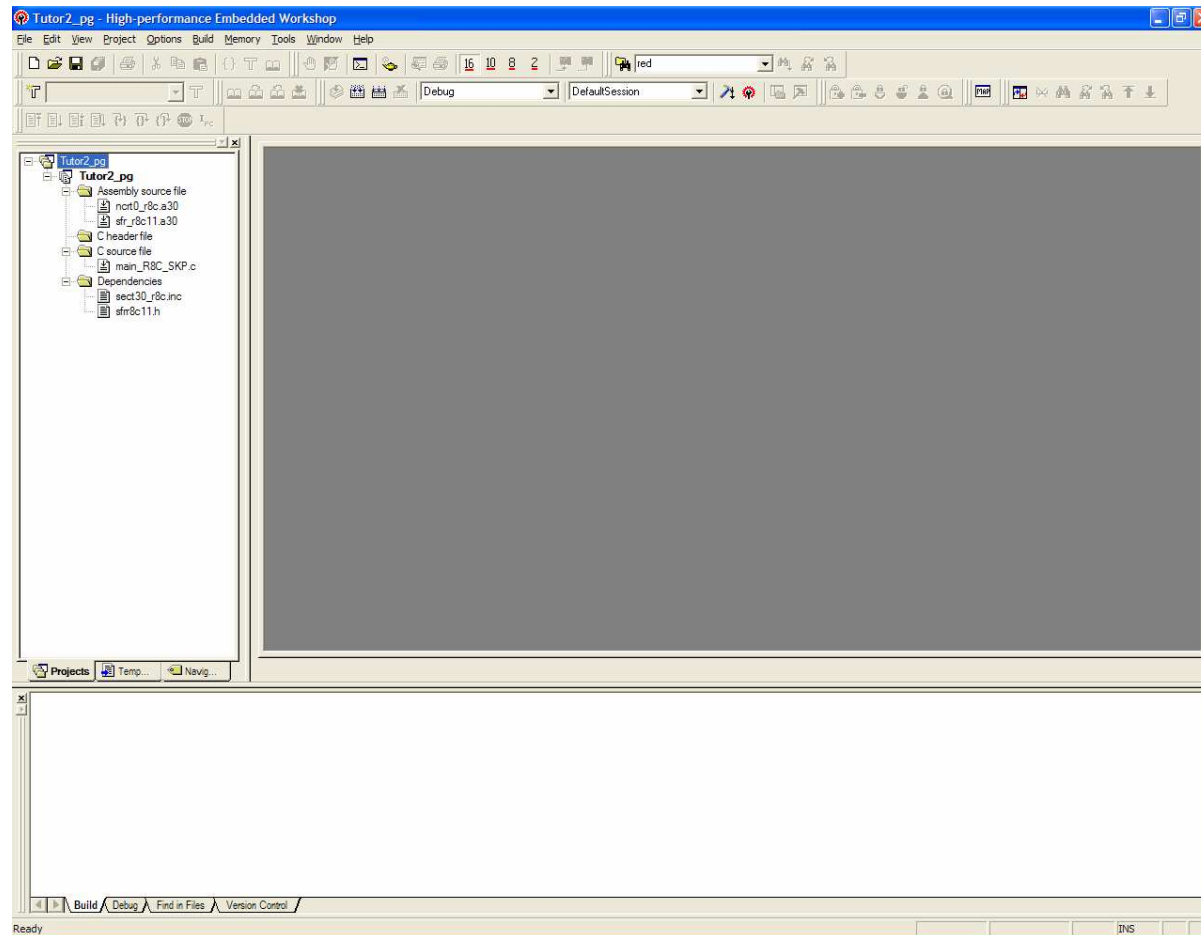
Creating a new project with the SKP project generator (4/4)



Click 'OK'.

The project generator information is shown once the project has been created.

HEW after creating a new project using the SKP project generator



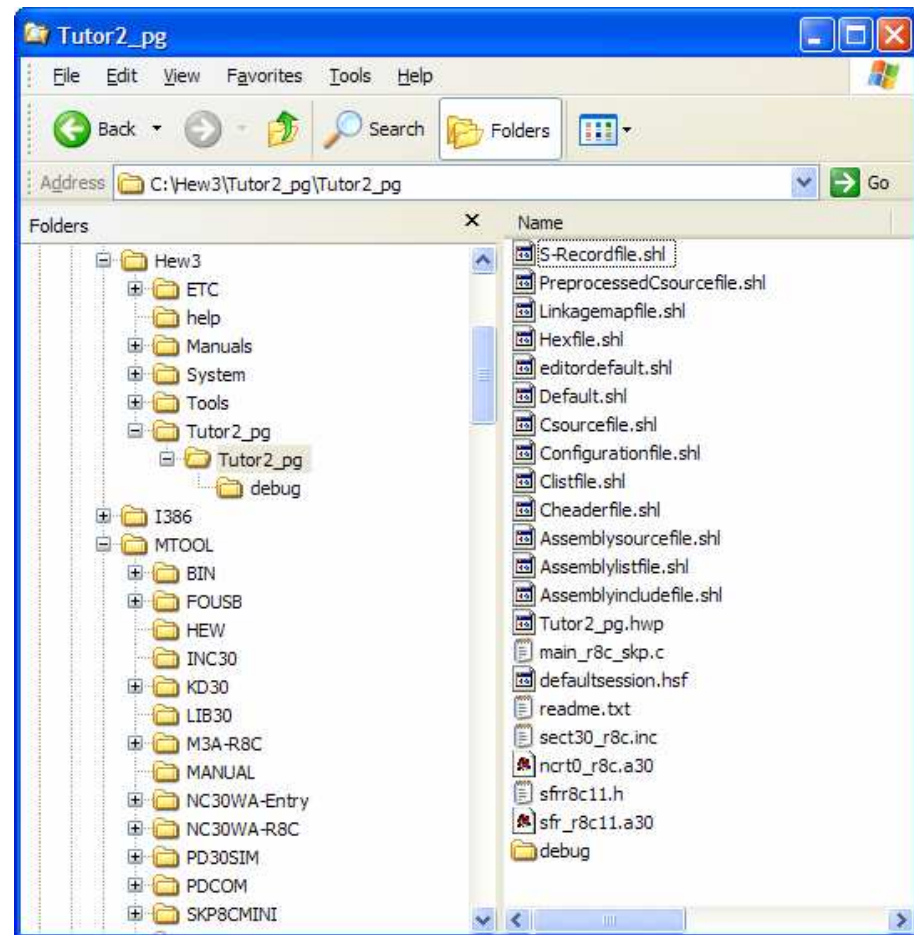
SKP Project Generator Summary (1/2)

The following is a summary of what happens when creating a new project using the SKP project generator Empty Project:

1. The following files are created in the workspace or project directory (in this example, under C:\hew3\Tutor2_pg):
 - A copy of the user startup ([ncrt0_r8c.a30](#) and [sect30_r8c.inc](#)) files.
 - A .c file ([main_R8C_SKP.c](#)) that contains the main function.
 - Copies of the SKP header file ([sfr8c11.h](#)) included in the .c file.
 - A copy of the [sfr_r8c11.a30](#) file so SFR names are visible in KD30.
2. Links the startup files first as shown in “Linking the startup files first” slides (25 & 26).
3. Configures the external debugger to launch KD30 as shown in the slide “Launching KD30 from HEW” (slide 28).
4. Adds the phase to generate a hex file when building a project as shown in the slide “Generate a hex file for Programmer” (29).

SKP Project Generator Summary (2/2)

The project structure and files created when using the SKP project generator are shown here.



Creating a New Project Environment

The SKP Project Generator simplifies several steps in creating a new project but what if you already have source files? The following slides will walk you through the following:

- ☐ Creating a new workspace from scratch
- ☐ Adding source files
- ☐ Setting up the software development environment
 - including linker, build, debugger and programming configurations

Creating a New Project (1/8)

Select 'New Workspace' from the File menu...

1. Select 'Application'.

2. Browse to, or enter, 'C:\MTOOL\SKP8CMini\Sample_Code'.

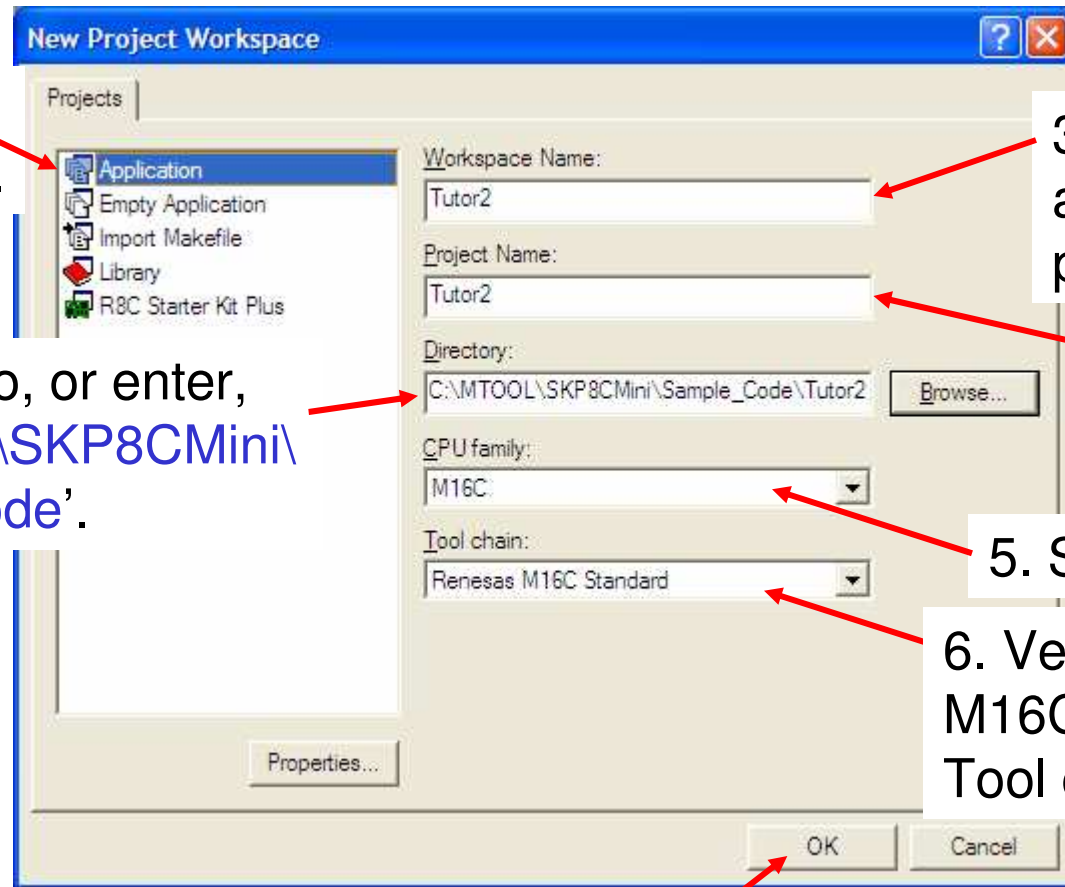
3. Enter 'Tutor2' as name of the project.

4. Leave as is (i.e. 'Tutor2').

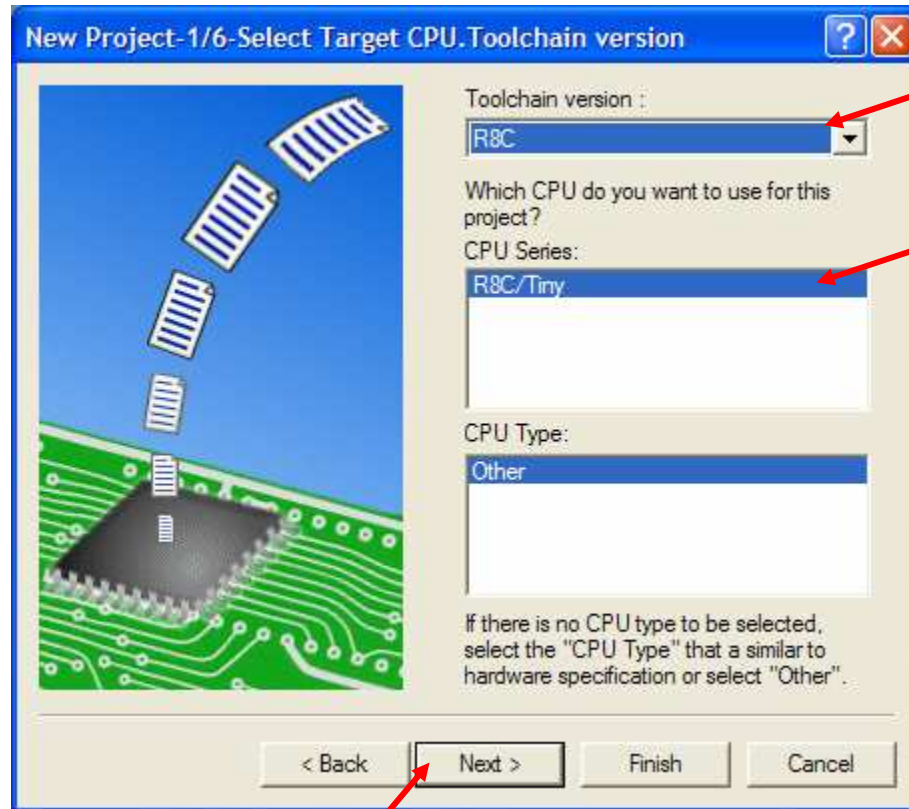
5. Select M16C

6. Verify Renesas M16C Standard Tool chain

7. Click on 'OK' button.



Creating a New Project (2/8)

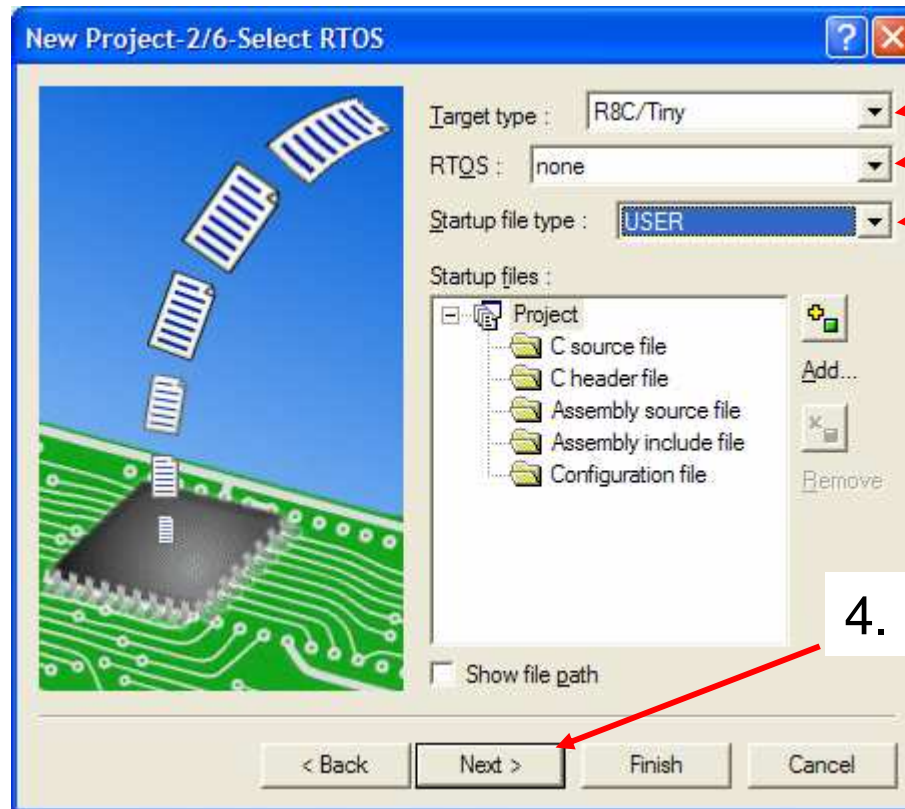


1. R8C is selected

2. R8C/Tiny selected

3. Click on 'Next' button.

Creating a New Project (3/8)

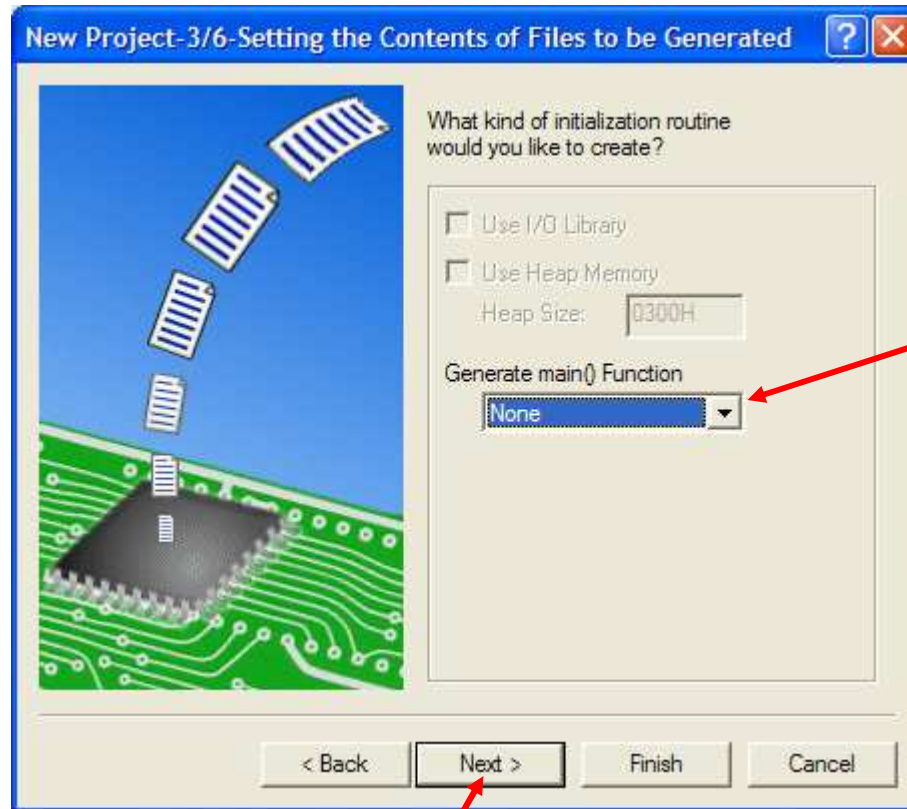


1. Select 'R8C/Tiny'.
2. Leave as is.
3. Select 'USER'.

4. Click on 'Next' button.

Note: 1. Differences between Default and USER Startup files is discussed after the project is created.

Creating a New Project (4/8)

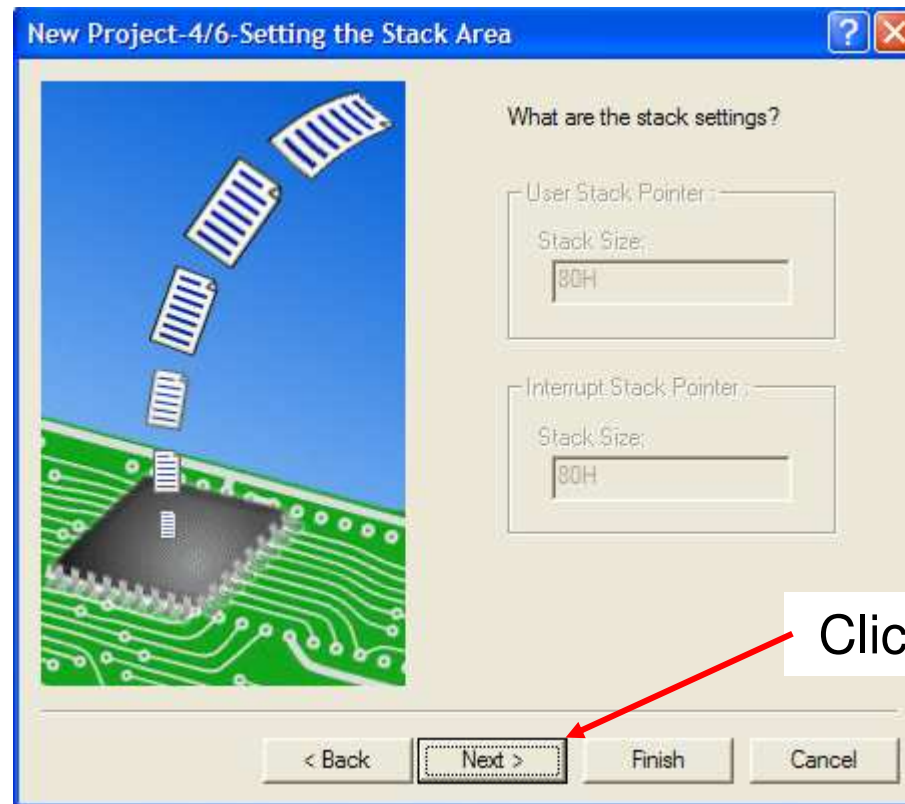


1. Select 'None' as we already have a file with the main() function

2. Click on 'Next' button.

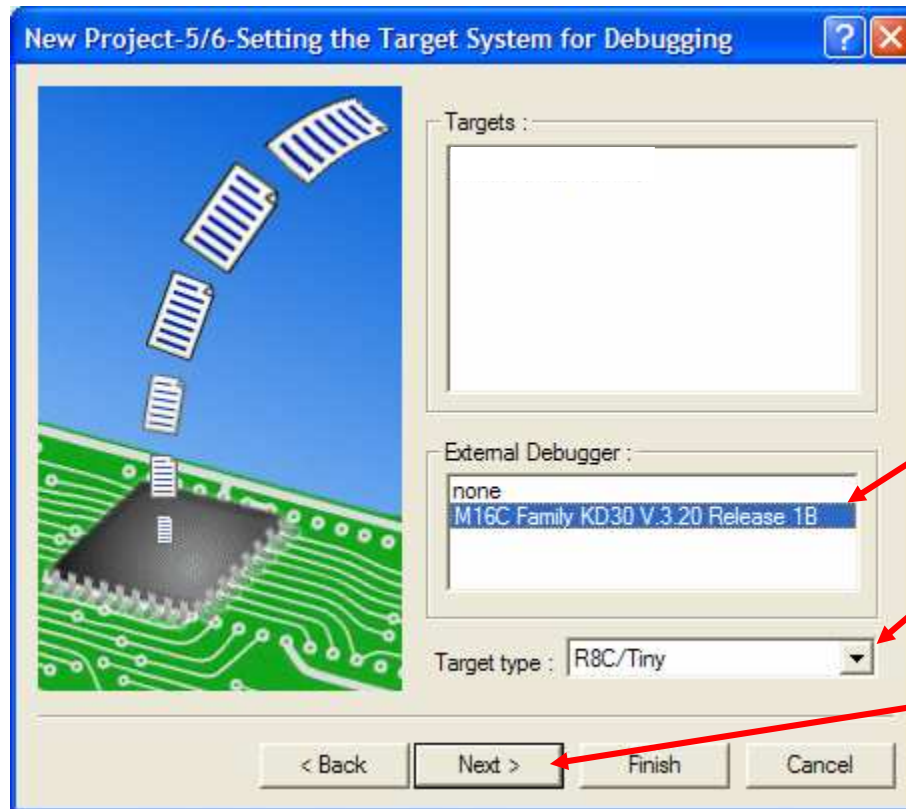
Creating a New Project (5/8)

The stack settings are grayed out because USER startup file was selected (see Creating a New Project 3/8). If DEFAULT startup file was selected, these settings become available.



Click on 'Next' button.

Creating a New Project (6/8)



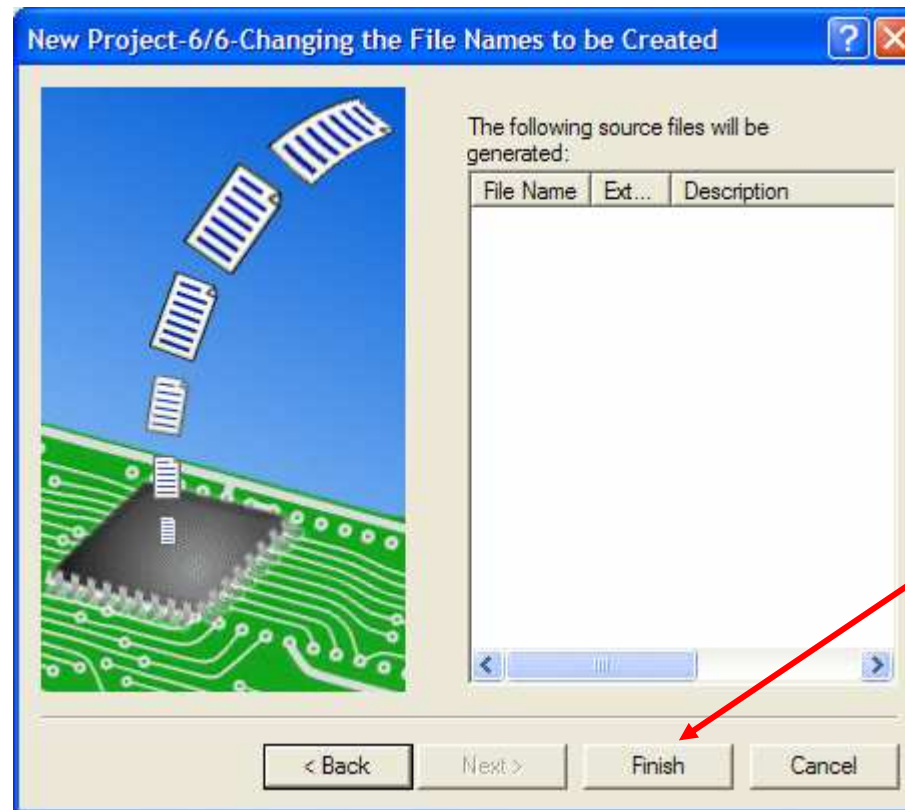
1. Select 'KD30'.

2. Leave as is.

3. Click on 'Next'.

Creating a New Project (7/8)

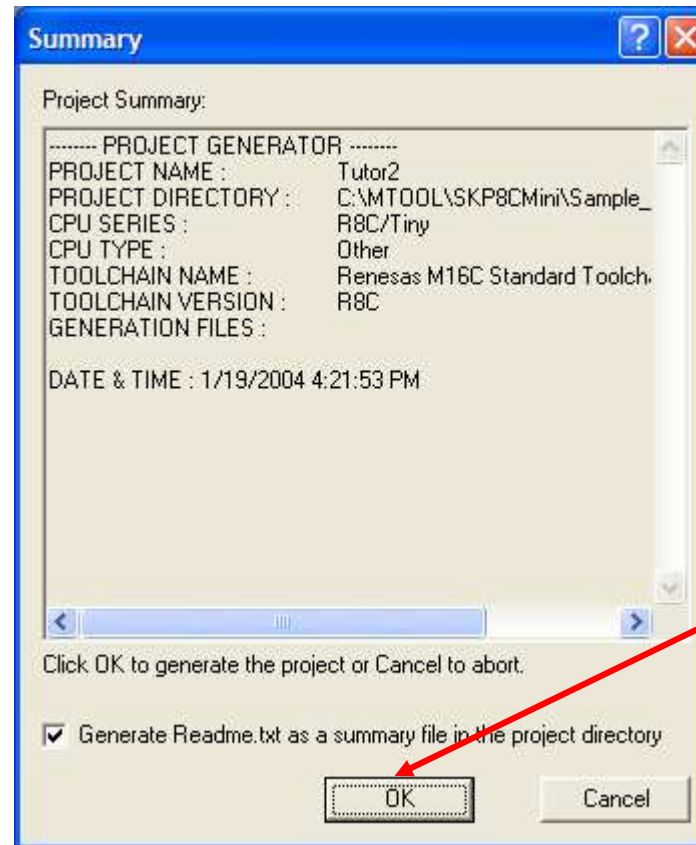
We already have the source files and selected USER startup files (see Creating a New Project 3/8 and 4/8) and so, there are no source files that will be generated.



Click on 'Finish' to complete project creation process...

Creating a New Project (8/8)

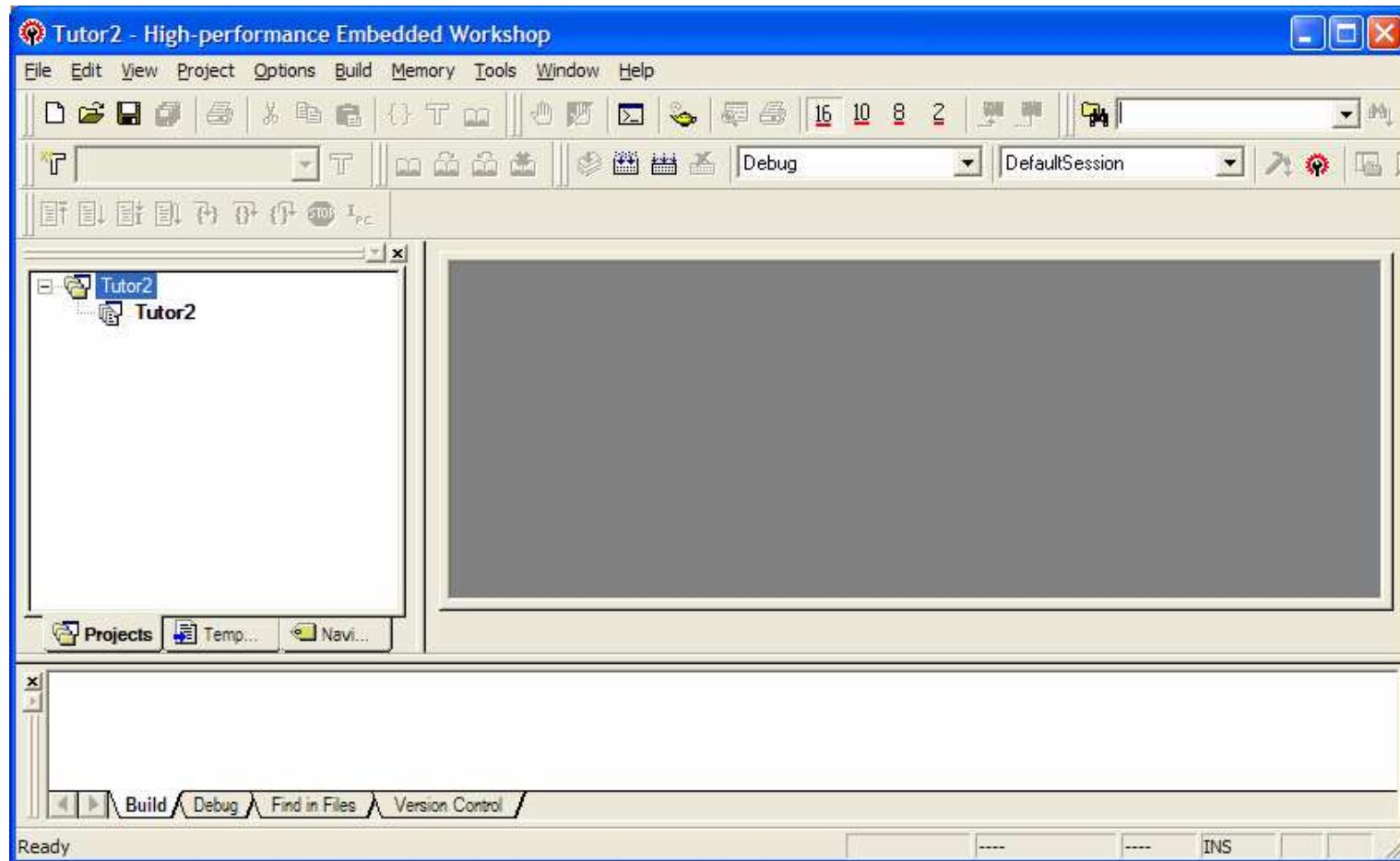
A project summary is displayed to indicate a successful creation of the new project, Tutor2.



Click on 'OK'.

HEW

After creating the project, HEW will look similar to the figure below.



Default and R8C Startup Files

Startup files have been specifically created for the Mini R8C SKP. It is recommended that you use these files ([ncrt0_r8c.a30](#) and [sect30_r8c.inc](#)) instead of the default startup files ([ncrt0.a30](#) and [sect30.inc](#)) that come with NC30. The differences between these startup files are listed below:

Ncrt0_r8c.a30

- Macros moved to sect30_r8c.inc.
- Stack size, Int stack size and vector addresses moved to sect30_r8c.inc.
- Heap removed.
- Processor mode initializations removed in ncrt0_r8C.a30.
- Conditional assembler switches for R8C/M16C.

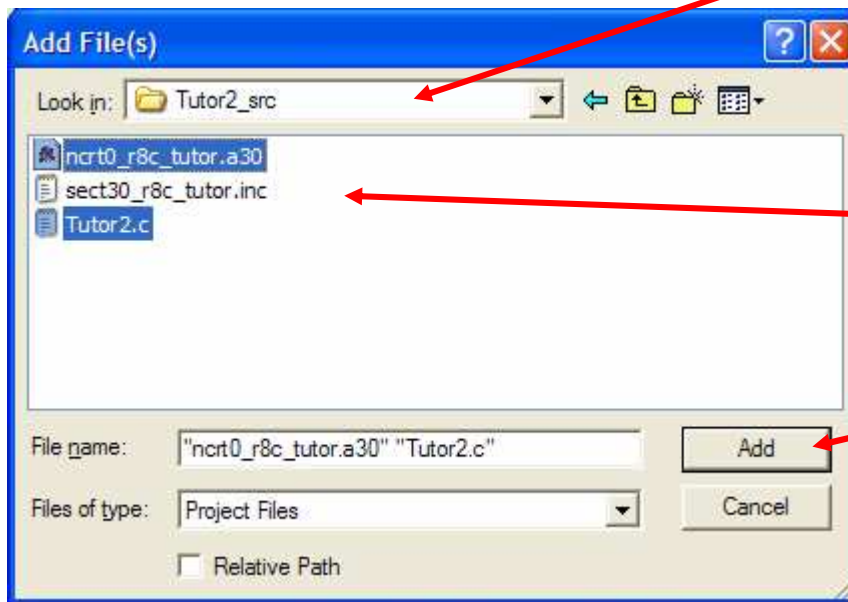
Sect30_r8c.inc

- Variable Vector Definition – Simplified and described in user file

Note: *You can use the default startup files but ensure that you understand how to make the necessary modifications. The customized startup files for the SKP can be found under [C:\MTOOL\SKP8CMINI\Sample_Code\Startup_Files](#) directory.*

Adding Source Files (1/2)

1. From HEW's **Project** menu, select **Add Files** and the Add Files dialog box is displayed.



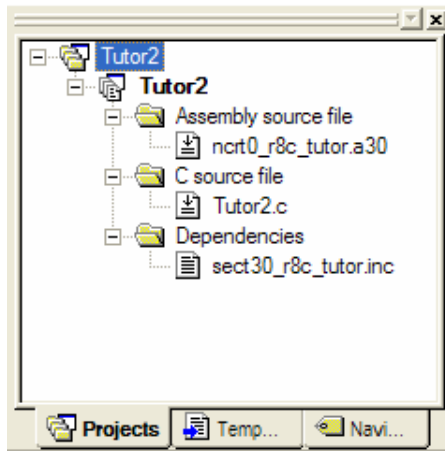
2. Browse to **C:\MTOOL\SKP8CMini\Sample_Code\Tutor2_src** folder, which contains the source codes for this tutorial.

3. Select **main_tutor2.c** and **ncrt0_tutor2.a30**.

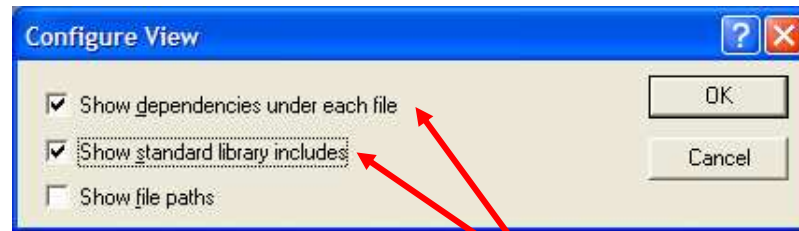
4. Click on **Add**.

Adding Source Files (2/2)

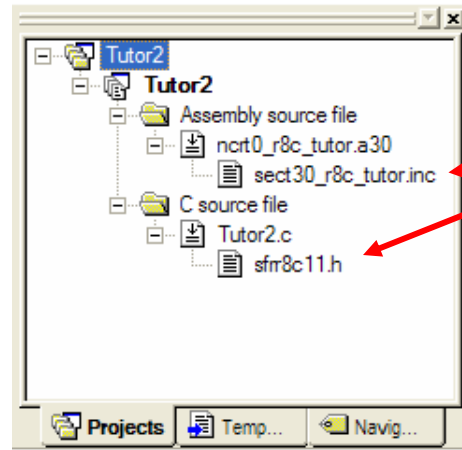
After adding source files, HEW's workspace will look like the figure below.



1. To display dependencies per source file, right-click on the Workspace window, and click on the **Configure View**.



2. Click on check boxes in Configure View dialog box.
3. Click on **OK** button.



Displaying the source file dependencies this way makes it easier to verify if the header files are included before building the project.

Linking the Startup File First (1/2)

After checking dependencies, NC30 must be set to compile and link the startup files first. The startup files contain information on memory addresses and sections which the linker uses to place the code at the correct addresses.

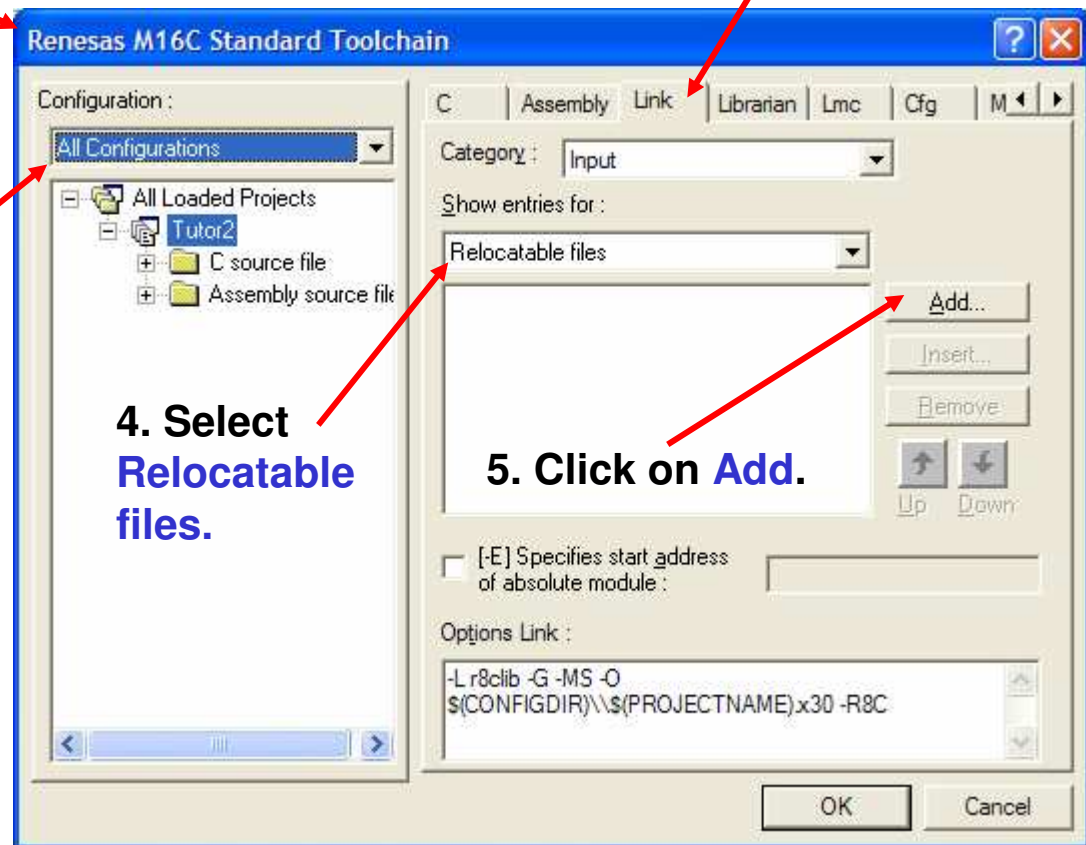
1. Select **Renesas M16C Standard Toolchain** from the **Option** menu and this window is displayed.

2. Select **All Configurations**.

3. Click on **Link** tab.

4. Select **Relocatable files**.

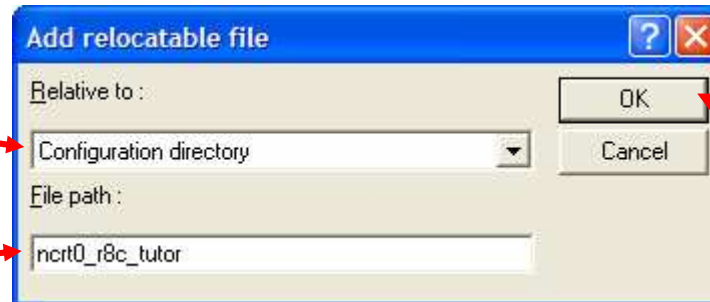
5. Click on **Add**.



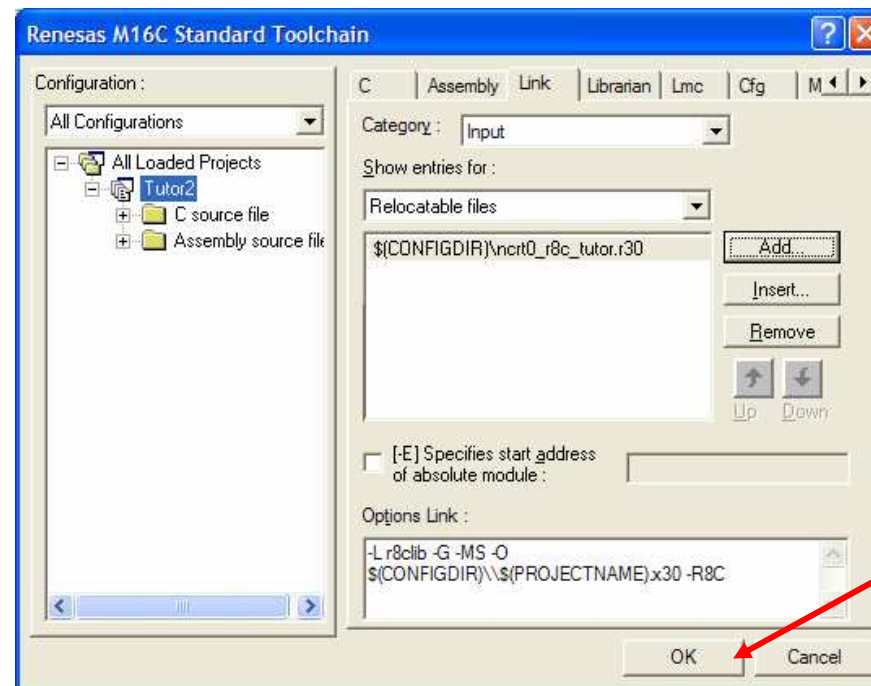
Linking the Startup File First (2/2)

1. Select **Configuration directory**.

2. Enter the startup source file, i.e. **ncrt0_r8c_tutor**.

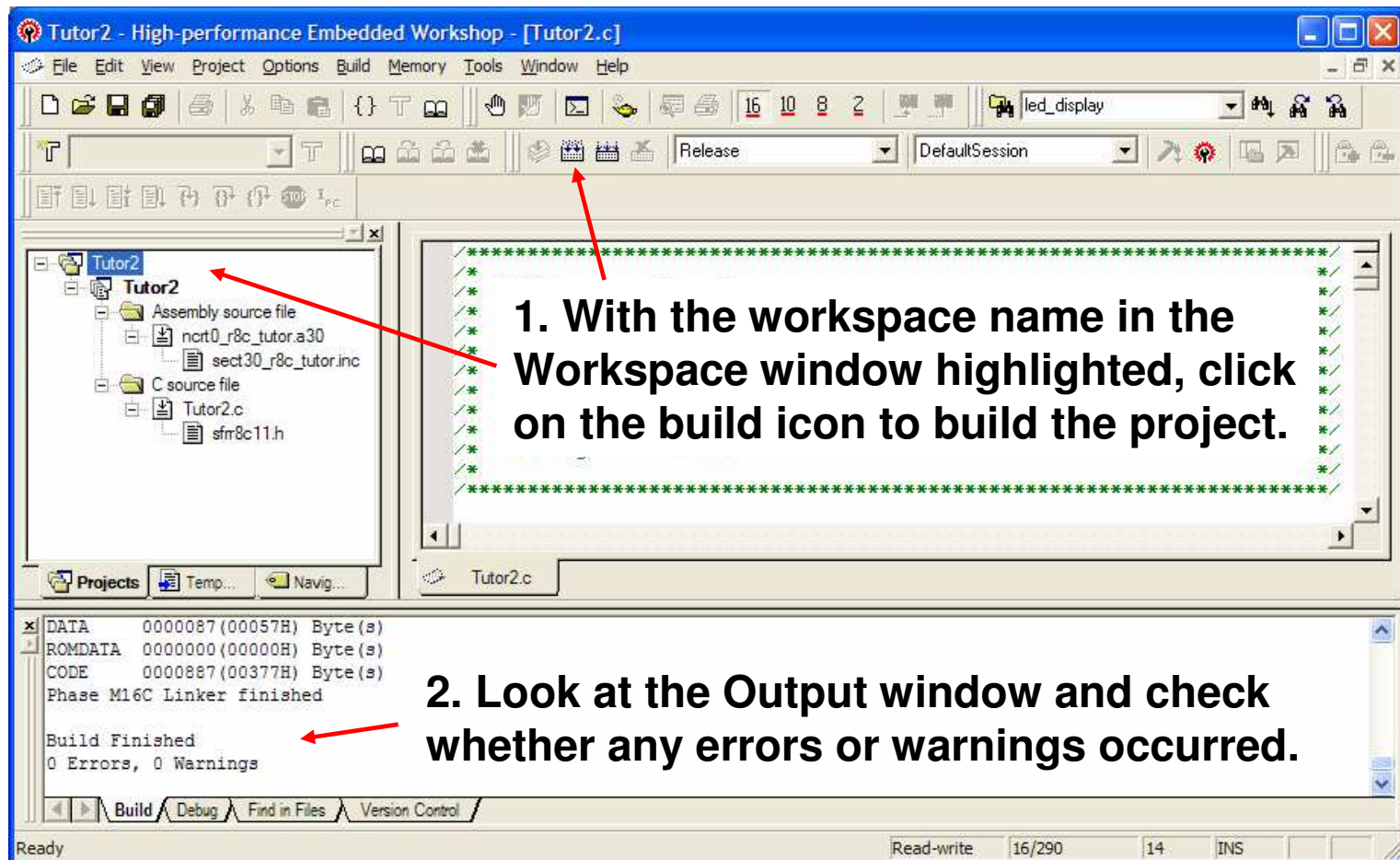


3. Click on **OK**.



4. Click on **OK**.

Building (compile & link) the Project

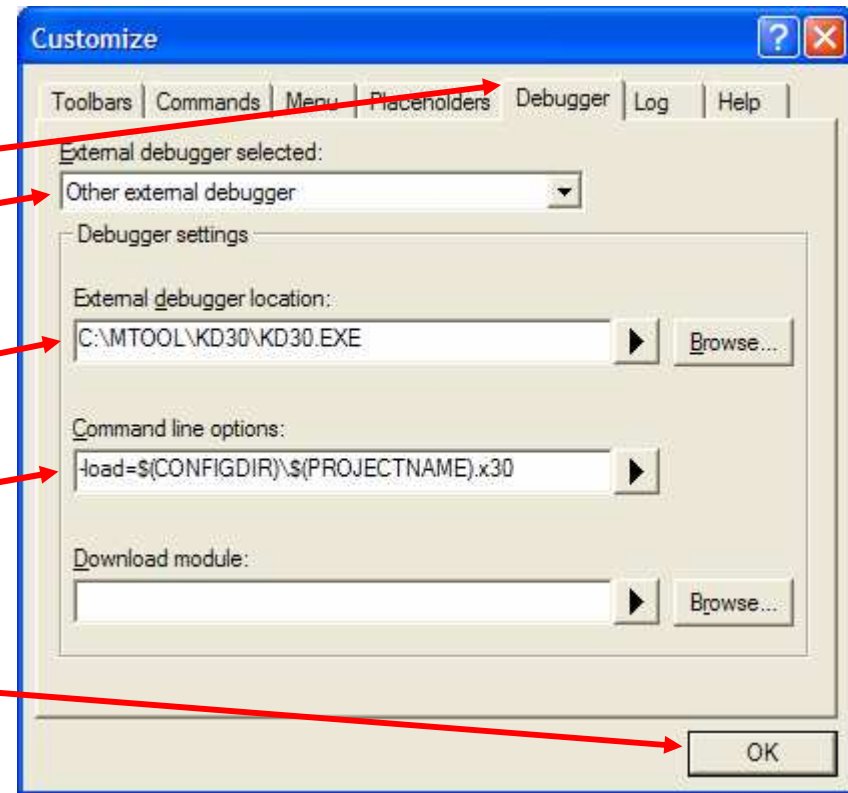


If there are no errors, you can try running the program on the mini R8C board using the ICD and KD30 Debugger.

Launching KD30 from HEW

KD30 can be launched directly from HEW, but first it must be configured as shown below:

1. Select **Customize** from from the **Tools** menu.
2. Click on **Debugger** tab
3. Select **Other external debugger**.
4. Locate **KD30** from **C:\MTOOL\KD30** folder.
5. Enter **-LOAD=\$(CONFIGDIR)\\$(PROJECT NAME).x30**
6. Click on **OK**.
7. To launch KD30 (and download .x30 file) click on this icon.



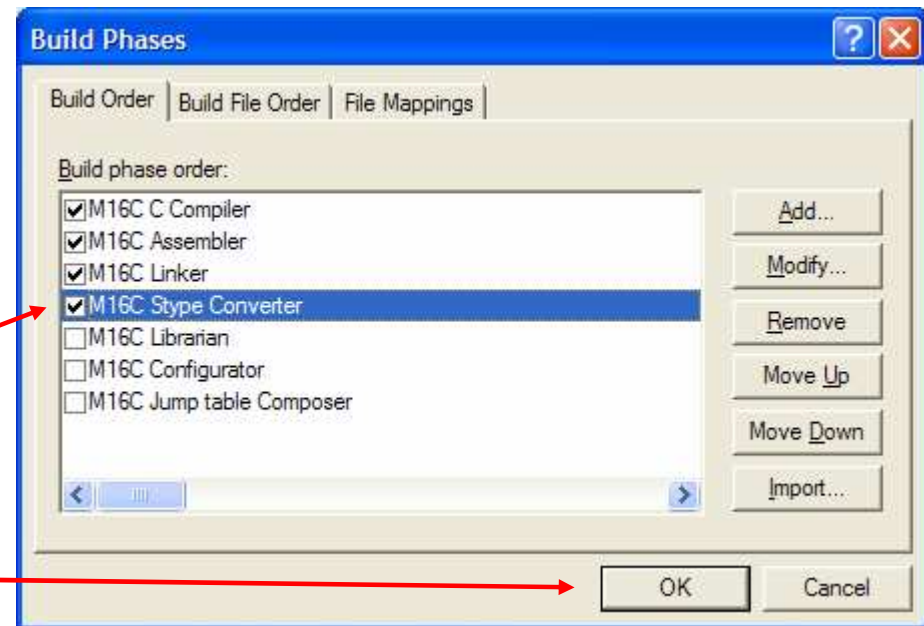
Generate a hex file for Programmer

After building a program, a file with an **.x30** is generated. For this example, **'tutor2.x30'** is generated. This **.x30** file can be downloaded using KD30. Device programmers, including the FoUSB Programmer, use hex files in Motorola or Intel format.

1. To generate a hex file during the build process, select **Build Phases** from the **Option** menu.

2. Click on **M16C Stype converter** checkbox.

3. Click on **OK**.



With the feature enabled, a **.mot** file is also created when building the project.

End of Tutorial 2

This is the end of tutorial 2. You can try modifying or downloading other sample programs from the \Sample_Code directory.

The completely built tutor2 project can be found in the Zip file under [C:\MTOOL\Sample_Code\tutor2_src](#) folder.

Be sure to check out the references on the following pages.

Have Fun!!

References and Recommended Reading

All documents that came with the SKP can be found using the “Document Description” from the Start > Programs > Renesas-Tools > SKP8CMINI menu.

- **SKP8CMINI User’s Manual:** This is a “must read” document! It details all the things you need to know on how to use the Starter Kit.
- **HEW User’s Manual:** To fully understand and get the most out of HEW. This is recommended reading.
- **KD30 Version X.XX Help:** The tutorial only covered the basics of KD30. Check out the Help menu to find out all of KD30’s features.
- **NC30 Version X.XX User’s Manual:** Check this manual out for features specific to the NC30 compiler.
- **R8C/11 Datasheet and Mini R8C Board Schematic:** These are required to write user application programs.
- **RTA-FoUSB-MON User’s Manual:** Read this manual to understand how the ICD works.

References and Recommended Reading

- **M16C/10/20/60 Series C Language Programming Manual:** This is a great document for any level of programmer. The first chapter is an intro to C programming. The next chapter explains the memory map of C programs on microcontrollers and the role of startup programs.
- **R8C/Tiny Series Software Manual:** This document describes the instruction set and timing information for the M16C/20/60 series CPU cores.
- **AS30 Version X.XX User's Manual:** Read this manual if you plan on writing programs in Assembly or when making changes to the startup file.
- **Application Notes and Sample Programs:** Application notes and other sample programs can be accessed from Renesas Technology America's website: <http://www.renesas.com>.

